

Revision of the genus *Ebbrittoniella* Martínez (Coleoptera: Scarabaeoidea: Ceratocanthidae)¹

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Revision of the genus *Ebbrittoniella* Martínez (Coleoptera: Scarabaeoidea: Ceratocanthidae). - The Oriental genus *Ebbrittoniella* Martínez, 1962 is redescribed. The current spelling *Eubrittoniella* is emended. *Cyphopisthes gestroi* (Paulian, 1942) is transferred to *Ebbrittoniella*. Presently the genus includes *E. ignita* (Westwood, 1883) and *E. gestroi* (Paulian, 1942). Some features of male and female genitalia and the affinities of the genus are briefly discussed.

Key-words: Coleoptera - Scarabaeoidea - Ceratocanthidae - *Ebbrittoniella* - Taxonomy - Oriental Region.

INTRODUCTION

In 1883 Westwood described *Acanthocerus* (*Sphaeromorphus*) *ignitus* on the basis of a specimen from Sumatra. In the subsequent fifty years Preudhomme de Borre (1886), Lansberge (1887), Gestro (1899) and Arrow (1912) dealt with this species; among these authors Gestro for the first time stressed the unnatural generic placement of the taxon, being the only Oriental representative in a New World genus. In 1962 Martínez, by examining a specimen from Sarawak in BMNH, followed Gestro's suggestion and created the new genus *Ebbrittoniella* to accommodate the taxon *ignitus*, while pointing out that the closest genus to it was the Neotropical genus *Acanthocerus* Macleay, 1819 (now *Ceratocanthus* White, 1842).

Paulian in his revision of Oriental Ceratocanthidae (1978) summarized available distributional data, redescribed the species and placed it in the key near *Cyphopisthes* Gestro, 1899. He also emended the name in *Eubrittoniella ignitus*. This emendation cannot be considered justified according to the art. 33 of ICZN, because in the original paper there is no clear evidence of an author's lapsus calami or printer's error as defined by art. 32 of ICZN and therefore the original spelling *Ebbrittoniella* should be maintained.

After that point the genus *Ebbrittoniella* has been listed only by Browne & Scholtz (1995, 1996, 1998) as *Eubrittoniella*, in a series of papers upon the hindwing articulation, base and venation of the Scarabaeoidea.

¹ 5th contribution to the knowledge of Ceratocanthidae.

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During revisionary studies on Old World Ceratocanthidae I had the opportunity to examine the type material as well as specimens from several collections, allowing me to confirm the validity of the genus. *Cyphopisthes gestroi* (Paulian, 1942) shares all the generic characters and therefore it is now transferred to *Ebbrittoniella*.

METHODS AND ACRONYMS

Elytral length is measured from the apex of elytral articular process to the more external point of the apical convexity, total width measurements are the sum of both elytral widths.

Drawings of genitalia were taken from pieces previously cleaned with 10% KOH solution.

Terminology follows Nel & De Villiers (1988) and Nel & Scholtz (1990) for mouthparts, Kukulová-Peck & Lawrence (1993) for wing venation and D'Hotman & Scholtz (1990) for male genitalia (thus the dorsal side of aedeagus is the concave one); for the remaining conventions I refer to Ballerio (2000).

EL	maximum elytral length
EW	maximum total elytral width
HL	maximum head length
HW	maximum head width
L	length
PL	maximum pronotum length
PW	maximum pronotum width
W	width
ABCB	A. Ballerio private collection, Brescia (Italy)
BMNH	The Natural History Museum, London
BPBM	Bernice Bishop Museum, Honolulu
HNHM	Hungarian Natural History Museum, Budapest
MCSN	Museo Civico di Storia Naturale "Giacomo Doria", Genova
MHNG	Muséum d'histoire naturelle, Genève
MNHN	Musée national d'Histoire naturelle, Paris
NHMW	Naturhistorisches Museum, Wien
NMPC	National Museum (Natural History), Praha
OXUM	Hope Department of Entomology, Oxford University, Oxford
RMNH	Nationaal Natuurhistorisch Museum, Leiden
SACF	S. Adebratt private collection, Frinnaryd/Boxholm (Sweden)
SMTD	Staatliches Museum für Tierkunde, Dresden
ZMUC	Zoologisk Museum, Københavns Universitet, København

TAXONOMY

Ebbrittoniella Martínez

Ebbrittoniella Martínez, 1962: 61 (description)

Eubrittoniella Martínez, Paulian, 1978: 506 (emendation)

Type species: *Acanthocerus (Sphaeromorphus) ignitus* Westwood, 1883 by original monotypy.

Etymology: named after Dr. E. B. Britton, former curator at BMNH. The gender is feminine.

DIAGNOSIS

The genus can be identified by the following combination of characters: labrum distally abruptly truncate, truncature marked dorsally by a slight carina bearing a row of long, erect, fine setae, truncature in frontal view forming a plate irregularly semi-circular, with semicircumference corresponding to the carina; genal canthus complete, touching the occipital area; dorsal ocular area large; anterior angles of pronotum broadly rounded; mesotibiae short and wide (W/L ratio = 0.3), in ♂♂ with the inner apical spur straight and very short; protibiae with outer edge almost smooth (low magnification), ending with a single tooth in both sexes; apical spur of protibiae sharp and slender.

DESCRIPTION

Medium to large Ceratocanthidae; volant.

Head: W/L ratio = 1.8, subpentagonal, anterior edge forming a triangle with obtuse apex (about 150°), both sides of the triangle smooth and almost rectilinear, not reflexed upward; genae aligned with fore edge, forming a right angle with genal canthus; genal canthus narrow, straight and complete, touching the occipital area; dorsal ocular area large; dorsal interocular area about five times the maximum width of the dorsal ocular area; ventral ocular area very large; head surface almost plane.

Pronotum: W/L ratio = 1.8, slightly wider than maximum elytral width, evenly and broadly convex; anterior edge feebly bisinuate; anterior angles distinctly but slightly protrudent forward, broadly and regularly rounded; sides obtusely rounded; base narrow, a very thin bead present anteriorly and at each side of base; base with a weak callosity marking each extremity of base of scutellum.

Scutellum: very large, longer than wide (W/L ratio = 0.7), sides proximally subparallel and distinctly notched by apical portion of mesepisternum and elytral articular process, then convergent to form a triangle with apex very elongate and acute and sides slightly curved inward; apical portion of mesepisterna (see Ballerio, 2000) visible from above, very large, larger than elytral articular process, subrectangular, smooth and shiny (Fig. 2d).

Elytra: slightly longer than wide (W/L ratio = 0.9), maximum width near middle, apex in lateral view fairly reentering inward; slightly flattened on disc, then abruptly convex at sides to form a pseudoepipleuron not marked by any lateral carina; marginal elytral area narrow, almost indistinct; elytral suture very feebly raised; sutural stria very fine and close to suture, limited to distal third; inferior sutural stria absent; striated articular area well developed and visible in lateral view, relatively wide and long; elytral articular process well developed, smooth and shiny.

Apical extremity of clypeus (see Ballerio, 2000) short and transversely grooved. Labrum (Fig. 4b) wide and short, proximally with surface microreticulated, distally

abruptly truncate, truncature marked dorsally by a slight carina bearing a row of long, erect, distally curled, fine setae; truncature in frontal view forming a plate irregularly semicircular, with semicircumference corresponding to the carina; surface of plate almost smooth, bearing few long setae. Distal epipharynx longitudinally divided by a very sharp strong anterior median process, distally very raised; median brush and corypha absent; apical fringe made of long fine setae, absent in the middle; lateral combs made of long fine setae. Mentum ventrally flat, deeply emarginated in the middle of anterior edge, emargination regularly wide-U-shaped; labial palpi (including palpiger) four jointed, first joint short and transverse, joint two securiform, joint three short and ovoidal, the same length of the second, and joint four subconical, about two times the length of the former, all joints, apart from the last one, fringed with long setae. Maxillae (Fig. 3a) with a very elongate single lacinia, covered with fine long setae, monolobed galea proximally sclerotized and distally clothed with very coarse short thick bi- or triphid setae (galeal brush) (Fig. 3b); maxillary palpi (including palpiger) four jointed, palpiger very small, joint two wide and relatively short, distinctly wider than the following joints, joint three about as wide as long, joint four long and subconical, slightly longer than the preceding two together, apically bearing some short sensilla. Mandibles elongate, slightly asymmetrical, apicalis more or less gently bent at about a right angle with apex short and acutely pointed, mesal brush narrow and well developed, conjunctive present, molar lobe very strong. Antennae 10-jointed, scape large, distally subcarinate (securiform), distally bearing some setae, funicle short with pedicellum plump and rounded, the remaining joints very short, distinctly wider than long, antennal club three-jointed, joints hairy, relatively short, narrow; club small, about as long as wide and as wide as the length of funicle ($L_{\text{funicle}}/L_{\text{lamellae}} = 2.1$).

Ventral areas of prothorax: (Fig. 4a) sides of propleura smooth, very excavated and folded in, excavation with a further shallow narrow reniform excavation inside (visible also in dorsal view against the light as a dark reniform patch). Procoxae transversely oriented, apices nearly touching each other. Anterior trochanters with anterior tips bearing a tuft of long setae. Profemora slender (W/L ratio = 0.2), posterior edge without emargination, surface smooth. Protibiae almost straight, outer edge smooth at low magnification (at most very slightly serrate: few feeble denticles visible at 45x); apical spur relatively short, sharp, very gently and feebly curved downward. Protarsi with first article as long as the following three together, articles two and three slightly dilated, article five slightly longer than the former; each tarsomere, with the exception of the last one, ventrally bearing a tuft of dense fine setae. Mesosternum forming a sharp fine carina, protruding between mesocoxae and joining metasternum. Mesocoxae almost adjacent to each other, longitudinally oriented. Trochanters with acute posterior tip. Mesofemora slender (W/L ratio = 0.3), surface smooth, with posterior edge emarginated at distal third, emargination preceded by a small distinct tooth. Mesotibiae subrectangular, short (W/L ratio = 0.3), inner angle of apex with two straight apical spurs. Mesotarsi inserted near the inner angle of apical edge, slightly longer than apical edge of tibia (exceeding it for the length of the last tarsomere), with first three articles subequal in length, fourth shorter, fifth almost as long as the preceding two; each tarsomere, with the exception of the last one, ventrally bearing a



FIG. 1 — a: *Ebbrittoniella ignita* (Westwood), habitus of adult (Lata Jarom); b: *Ebbrittoniella gestroi* (Paulian), habitus of adult (Cameron Highlands) (drawings by J. Kobylák) (scale bar: 1mm).

tuft of dense setae. Trochanters of metafemora with acute posterior tip, metafemora plumper than mesofemora (W/L ratio = 0.3), surface wrinkled, posterior edge distally with a small emargination. Metatibiae triangular, wide (W/L ratio = 0.5), ending with two straight sharp fine paired spurs. Metatarsi almost as long as the apical edge of tibia, first article almost as long as the following three together, fifth almost as long as the first one; each tarsomere, with the exception of the last one, ventrally bearing a tuft of dense setae.

Wings (Fig. 2a) (Lwing/Lelytron ratio = 2.1): fully developed, MP_{1+2} - RP loop present with RP long (although weakly sclerotized), MP_4 medium sized, apical field with a vertical secondary sclerification near the radial cell. First axillary with no appreciable differences at species level (Fig. 2b).

Sexual dimorphism: ♀♀ (Fig. 2c: B) have the apical outer tooth of protibiae distinctly sharper and more protruding outward and forward than in ♂♂ (Fig. 2c: A) and mesotibiae with the inner apical spur straight and approximately as long as the outer, while in ♂♂ it is straight but very short and very difficult to detect.

Male genitalia: Genital segment (Fig. 5c) Y-shaped (no appreciable differences at species level), fairly sclerotized, with a distinct manubrium about as long as the basal triangle, branches forming the manubrium apparently not fused together, although connected by a transparent membrane (after treatment with KOH), base of triangle very weakly sclerotized; basal piece of aedeagus large and twisted (Fig. 5a), about four times the length of parameres; internal sac very large about three times as long as tegmen, internal sac distally with coarse spicules and setae; temones present; parameres (Fig. 5b) short and slightly asymmetrical (hardly appreciable differences at species level), laterally flattened, between parameres dorsally lies a narrow subtriangular sclerite.

Female genitalia: bursa copulatrix (Fig. 5d) with one small symmetrical sub-circular or subtriangular sclerite (very variable in shape and without appreciable differences at species level) with a hole in the middle; spermatheca (Fig. 6) strongly sclerotized, large and distinctly wide-U-shaped; genital palpi weakly sclerotized, sub-circular, relatively small and short.

Ebbrittoniella ignita (Westwood, 1883)

Fig. 1a

Acanthocerus (*Sphaeromorphus*) *ignitus* Westwood, 1883: 2 (description)

Acanthocerus (*Sphaeromorphus*) *ignitus* Westwood: Preudhomme de Borre, 1886: 80 (catalogue)

Synarmostes ignitus (Westwood): Lansberge, 1887: 209 (list)

Acanthocerus ignitus Westwood: Gestro, 1899: 462 (redescription, distribution and key)

Acanthocerus ignitus Westwood: Arrow, 1912: 49 (catalogue)

Ebbrittoniella ignita (Westwood): Martínez, 1962: 61 (redescription and iconography)

Eubrittoniella ignitus (Westwood): Paulian, 1978: 506 (redescription, distribution, iconography and key)

Type locality: Koetoer (Indonesia: Sumatra).

Material examined - Holotypus ♂: Koetoer 6.78 / Sum. Exp. Koetoer 6.78 / Typus / *Acanthocerus ignitus* Westw. / Museum Leiden *Acanthocerus ignitus* det. Westwood / 6903 / *Eubrittoniella ignitus* (Westw.) R. Paulian det. / *Ebbrittoniella ignita* (Westw.) A. Ballerio det. 1997 (RMNH), [very damaged specimen, pinned, lacking the head, which is glued together with legs and mouthparts on a card pinned with a separate pin, without any data bearing label].

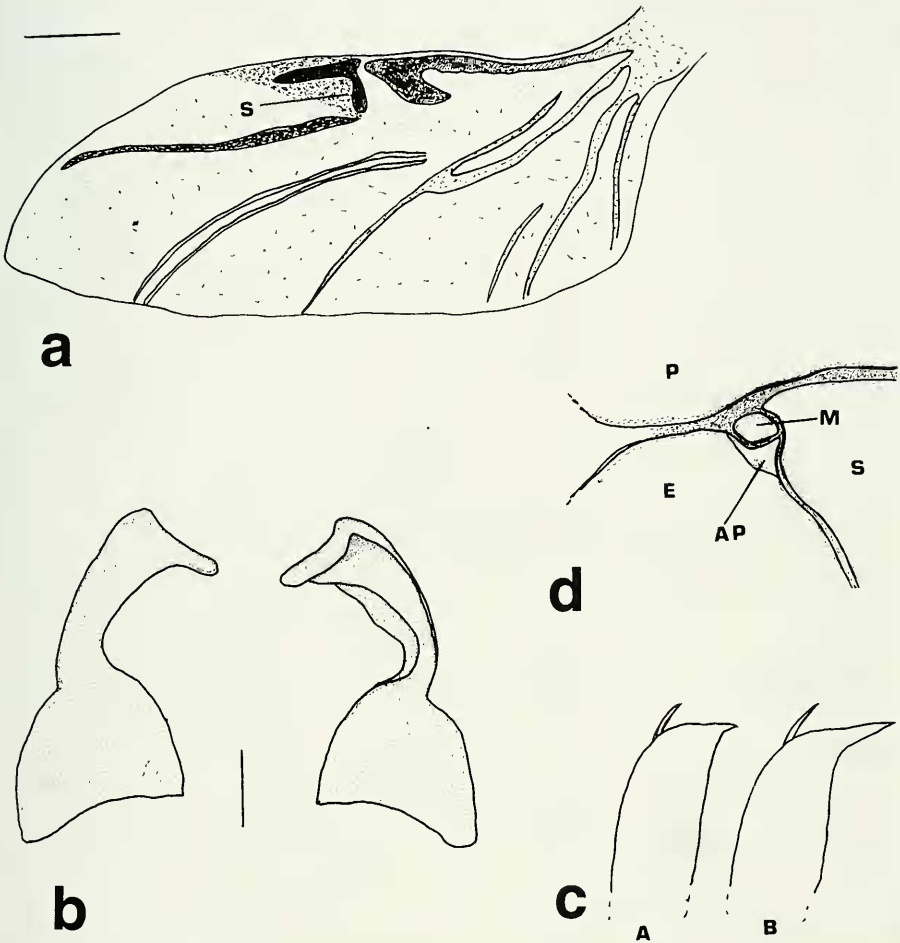


FIG. 2 – a: *E. gestroi* (Cameron Highlands), wing: vertical secondary sclerification (S) (scale bar: 1 mm); b: *E. gestroi* (Cameron Highlands), first axillary (scale bar: 0,1 mm); c: *Ebbrittoniella*, apex of foretibiae (dorsal view): (A) male, (B) female; d: *Ebbrittoniella*, area near scutellum as seen when the beetle assumes the “rolled up” posture: apical portion of mesepistemum (M), articular process of elytron (AP), scutellum (S), elytron (E), pronotum (P).

Other 32 specimens (7 ♂♂ and 4 ♀♀ dissected). INDONESIA. Kajoe Tanam [Sumatra], Klein (ZMUC); Sumatra, Manna, M. Knapper (RMNH); Ruuyer Payakor, Sumatra (RMNH); Sentinjak, Sumatra, 1800 ft., Jan. '98, 99-95 (BMNH); Setinjak, W. Sumatra, I to VII. 98, (Ericsson) (Coll. C. Felsche, Kauf 20, 1918) (SMTD); Sumatra, Padang Sidempoean, XII.1902-I.1903 (MNHM); Sumatra (ex Mus. Van Lansberge) (MNHM). Nias Island. Is. Nias, U. Raap (MNHM); Hili Madjedja, N. Nias, 4me trim. 195, I.Z. Kannegieter (ex Mus. Van de Poll) (MNHM); Is. Nias 1897-98, U. Raap (RMNH); Is. Nias 1897-98 U. Raap (MCSN). Kalimantan-Timur: Apokayan, Long Sungei Barang 900 m, secondary forest, 15-23.02.1997, leg. C. & P. Zorn. MALAYSIA. Malay penin.: Selangor, Giunting Simpak, Jan. 2nd 1933, N.M. Pendlebury,

F.M.S. Museum (BMNH); Malaysia: Pahang/Johor, Endau Rompin NP, 100 m, Salendang, 28.2-12.3.1995, leg. Strba & Hergovits (NHMW); Malaysia – Pahang, Banjaran Benom, Lata Jarom, 6-8.3.1997, Ivo Jeniš leg. (ABCB); ibidem, 18-21.3.1997, Ivo Jeniš leg. (ABCB), W. Malaysia, Pahang, Baniaran Benom Mts., K. Ulu Dong 10-15 km SSE, 17-23.IV.1997, D. Hauck leg. (ABCB); Sarawak, C. S. Brooks, B.M. 1928-193 (BMNH); Malaysia: Sabah, Sipitang, Mendolong, T1B/W4, 11.V.1988, leg. S. Adebratt, 12-60, 2859BC (SACF). OTHER. Sunda-Inseln v. Studt/coll. Petrovitz (MHNG).

DESCRIPTION

HL= 0.8-1.2 mm HW= 1.6-2 mm PL= 1.5-2 mm PW=2.8-3.3 mm EL= 2.9-3.9 mm EW= 2.7-3.6 mm.

Dorsally very shiny and entirely brightly metallic: red with gold/green faint, elytral suture, scutellum, sides of elytra, sides of pronotum and sides of head deep electric blue with green faint; ventrally alutaceous, reddish brown, antennae yellowish. Pubescence invisible at low magnification, otherwise formed by very short and fine hyaline erect setae, subject to wear. Head surface with a variable number of transverse lines, occupying anteriorly the two thirds of head; vertex with sparse simple punctures, often preceded by a very short transversal impressed line. Pronotum very convex, surface with very small horseshoe-shaped punctures (containing a small simple puncture in the middle) or sometimes simple punctures, never very dense, usually sparser on disc and slightly coarser near anterior angles; the horseshoe is opened outwards in the punctures at sides and inwards in the punctures on the disc. Scutellum with horseshoe-shaped punctures with horseshoe opened toward apex, punctures denser near sides. Elytra distinctly convex, surface with punctures horseshoe-shaped, small, never very dense, variably distributed, horseshoe opened toward suture or apex; two longitudinal lines along the suture at medial and distal third of length; pseudoepiplevra with some longitudinal lines; humeral callus not protruding; articular area very large. Outer face of meso- and metatibiae with short impressed lines varying from longitudinal to transverse and short erect setae through the entire surface. Wings with vertical secondary sclerification of apical field finer than in *E. gestroi* and MP_{1+2} - RP loop shorter. Spermatheca as in figs. 6a, b, c, d.

VARIABILITY

Although the majority of individuals examined shows the typical colours, one pair from Pahang is uniformly dark green, one individual from Nias is uniformly deep amaranth and the individual from Sabah is yellowish with greenish metallic sheen; there is a strong variability also in the punctures (mostly the ones of pronotum), which vary in size and density: the specimen from Sabah has the entire head surface covered by transverse lines, the amaranth specimen from Nias has the entire pronotum completely smooth, while the pair of dark green specimens has punctures coarser and more impressed than the other specimens. The very fine pubescence varies and in some specimens is no longer visible (probably ripped off by wear).

DISTRIBUTION AND HABITAT

Recorded from Peninsular Malaysia, Sumatra, Nias Island and Borneo. For habitat see under *E. gestroi*.

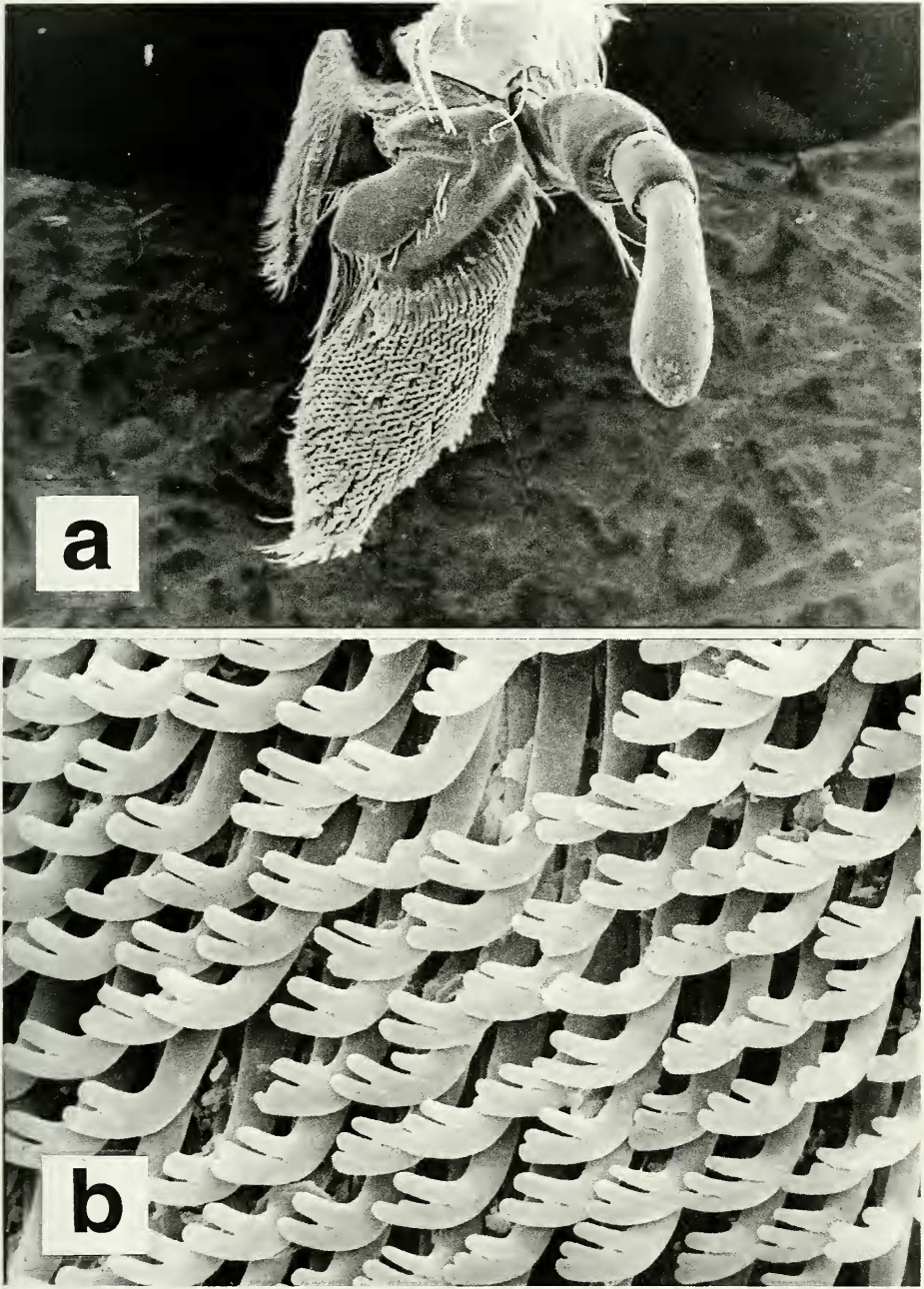


FIG. 3 – a: *E. gestroi* (Cameron Highlands), maxilla (SEM micrograph); b: *E. gestroi* (Cameron Highlands), detail of galeal brush (SEM micrograph).

REMARKS

Westwood (1883) described also a variety “paullo minor, obscurior,...” from Sarawak without naming it; examination of the specimen in OXUM revealed that it is an *Eusphaeropeltis* sp.

***Ebbrittoniella gestroi* (Paulian, 1942) comb. n.**

Fig. 1b

Philharmostes Gestroi Paulian, 1942: 70 (description and key)

Cyphopisthes gestroi (Paulian), 1978: 512 (new combination, redescription, distribution, iconography and key)

Type locality: Palembang (Indonesia: Sumatra).

Etymology: named after Dr. R. Gestro, late director of MCSN and specialist of Ceratocanthidae.

Material examined – Holotypus, ♀: Sumatra Palembang / Type / *Cyphopisthes gestroi* n. sp. det. R. Paulian, 1937/ *Ebbrittoniella gestroi* (Paulian) n. comb. det. A. Ballerio, 1997. (MNHN) [completely rolled up and glued on a card].

Other 141 specimens (15 ♂♂ and 15 ♀♀ dissected) – INDONESIA. Palembang [Sumatra], 1900, Bouchard (MCSN); MALAYSIA. Malaya: (W) Perak, Maxwell Hill, 1350 m., 17-20.III.1958, T.C.Maa collector, Bishop (BPBM); Malaysia – Perak, Banjaran Bintang, Maxwell Hill (Taiping), 18-19.2.1997, leg. Ivo Jeniš (ABCB); West Malaysia, Perak, Maxwell Hill, 900-1000 m, above Taiping City, 12-16.1.1995, leg. S. Bečvar j. & s. (ABCB); W. Malaysia, Perak: 25 km NE of Ipoh, 2100 m, Banjaran Titi Wangsa mts., Gunung Korbu, 4-13.III.1998, P. Čechovský leg.; W. Malaysia, Perak, 25 km NE of Ipoh, 1200 m, Banjaran Titi Wangsa mts., Gunung Korbu, 27.I-2.II.1999, P. Čechovský leg.; W. Malaysia, Pahang, 30 km E of Ipoh, 1500 m, Cameron Highlands, Tanah Rata, 20.II-3.III. 1998, P. Čechovský leg.; ibidem, 22-26.I.1999, P. Čechovský leg.; P. Malaysia-Pahang: Cameron Highlands, Tanah Rata umg., gn. Jasar, 1300 m, 25.II.1997, leg. Schuh & Lang (ABCB); West Malaysia, Pahang, C. Highlands, Tanah rata, 20-25.1.1995, Gn. Jasar, 14-1500 m, leg. S. Bečvar j. & s. (ABCB); West Malaysia, Pahang, Cameron Highlands, Brinchang, 18-19.1.1995, Gunung Berembam, 1600 m, leg. S. Bečvar j. & s. (ABCB); Malaysia, Pahang, Cameron Highlands, 2 km S of Tanah Rata on Tapah Road, montane rainforest, at light no. 93, 29.III.1995, leg. O. Merkl & L. Szikossy (HNHM); Malaysia, Pahang, Cameron Highlands, Tanah Rata, from illuminated white washed walls no. 77, 23-31.III.1995, I. O. Merkl (HNHM); Malaysia – Pahang, Banjaran Benom, Lata Jarom, 6-8.3.1997, leg. Ivo Jeniš (ABCB); Malaysia – Perak, Cameron Highlands, Tanah Rata, 13-16.3.1997, leg. Ivo Jeniš (ABCB); Borneo (Brit. N.), Sandakan bay (SW), Sapagaya Lumber Camp, 2-20 m, XI-3-157, J.L. Gressitt Collector (BPBM); North Borneo (SE), Forest Camp, .19 km N. of Kalabakan, 18.XI.1962, Y. Hirashima, Light trap, Bishop (BPBM); ibidem, 7-10.XI.1962 (BPBM); ibidem, 27.X.1962 (BPBM); ibidem, 10.X.1962 (BPBM); Malaysia – Sabah, Crocker Range National park, Longkogungan env., Ca. 750-850 m a.s.l., 19-21.VI.1996, 7c (NHMW); Borneo: Sarawak Bau District, Bidī, 90-240 m. 3.IX.1958, T.C. Maa Collector Bishop (BPBM); Sarawak, Kapit dist., Sebong, Baleh riv., 9-21.3.1994, Sv. Bílý leg. (NMPC), Sarawak, Kapit dist., Rumah Ugap vill., Sut. Riv., 3-9.3.1994, Sv. Bílý leg. (NMPC); Sarawak: Gunung Mulu Nat. Park, R.G.S. Exped. 1977-8, J.D. Holloway et al. B.M. 1978-206, site 2, january, camp 4, Mulu, 1790 m, 452463, lower montane (moss) forest, acl-understorey (BMNH).

DESCRIPTION:

HL= 0.9-1.1 mm HW= 1.5-1.9 mm PL= 1.3-1.8 mm PW=2.7-3.2 mm EL= 3-3.5 mm EW= 2.7-3.2 mm.

Dorsally metallic bronze/green with reddish faint, head, pronotum, scutellum and elytra covered by long recumbent yellowish setae; ventrally alutaceous yellowish/brown with antennae yellowish. Head as in *E. ignita* but completely covered by recumbent setae and dense punctures. Pronotum slightly less convex than in *E. ignita*,

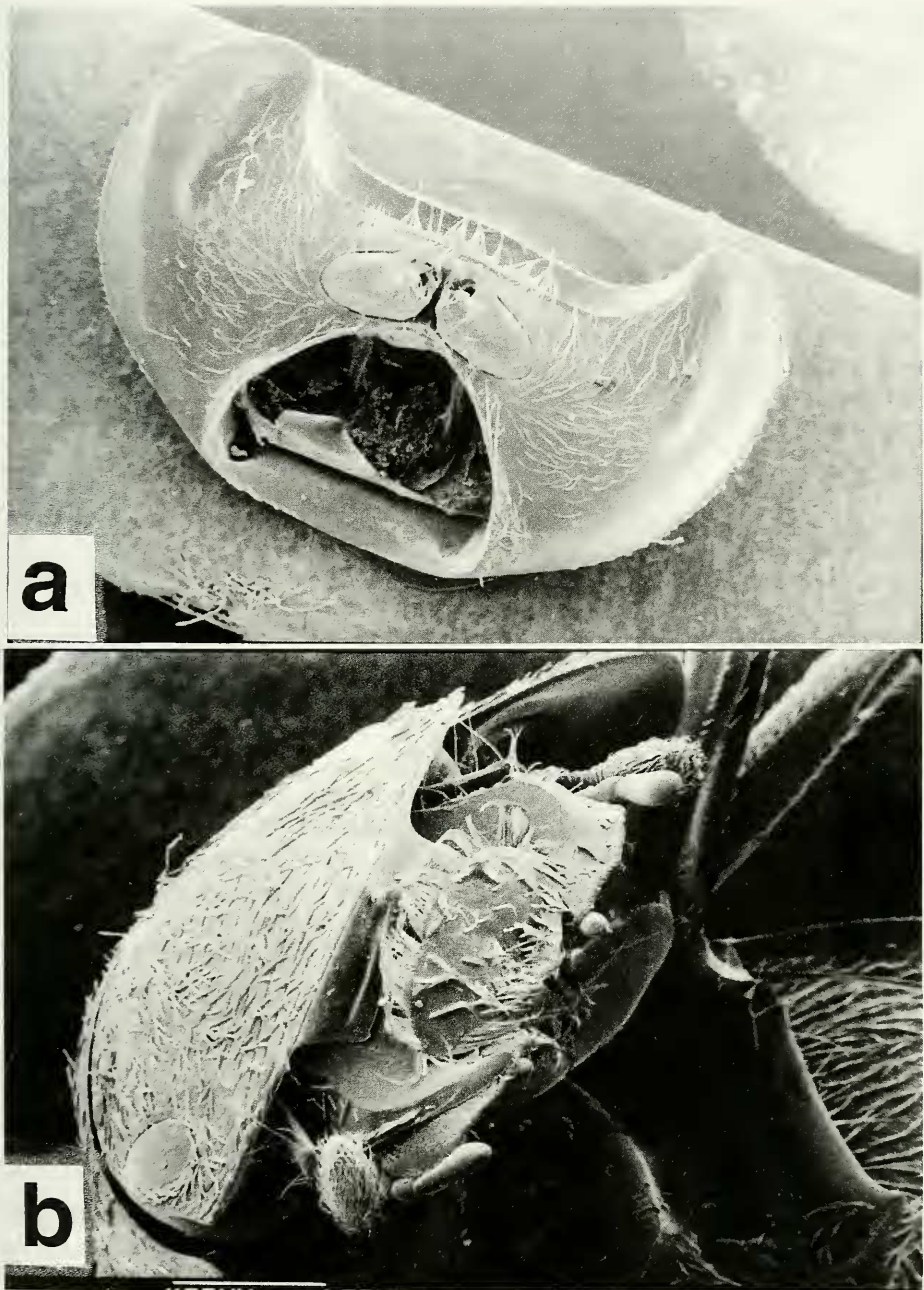


FIG. 4 - a: *E. gestroi* (Cameron Highlands): ventral areas of prothorax (SEM micrograph); b: *E. gestroi* (Cameron Highlands): head in fronto-lateral view, showing the truncature of labrum (SEM micrograph).

surface completely covered by very dense small horseshoe-shaped punctures, with horseshoe very short and almost transversal; each horseshoe with a small impressed puncture in the middle; pubescence very long and dense, recumbent, some subcircular small and weak depressions at each side of disc. Scutellum with coarse horseshoe-shaped punctures and long recumbent pubescence. Elytra slightly less convex than in *E. ignita*, surface with punctures less dense and slightly larger than on pronotum, relatively sparser near suture; proximal third with large longitudinal smooth areas between the suture and the pseudoepipleura; pseudoepipleura with transversal long dense horseshoe-shaped punctures. Humeral callus very developed and protruding outwards; articular area smaller than in *E. ignita*. Outer face of meso- and metatibiae with short impressed lines varying from longitudinal to transverse and short erect setae through the entire surface. Wings (Fig. 2a): vertical secondary sclerification of apical field thicker than in *E. ignita* and MP_{1+2} - RP loop distinctly longer. Spermatheca as in figs. 6e, f, g, h.

VARIABILITY

E. gestroi is less variable compared to the former species; the colours vary from bronze green to green with faint reddish sheen. In the pair from Lata Jarom the smooth elytral areas are very small, while punctures and lines are slightly more impressed.

DISTRIBUTION AND HABITAT

Recorded from Peninsular Malaysia, Sumatra and Borneo (Sabah and Sarawak).

Both species are found in rainforests, they are sympatric and sometimes also syntopic (Lata Jarom, leg. Jeniš). *E. ignita* seems to be restricted to lowland rainforests, where it has been collected by beating leaves or with window traps; *E. gestroi* shows a broader ecological range because it is found in both lowland and montane forests (till 2100 m a.s.l.), where it is the most commonly collected Ceratocanthidae. There are several records of this species at light. The unusual vestiture of galeal brush, which is covered by short and thick bi- or triphids dense setae (while in most other Ceratocanthidae these setae are longer, finer and usually sharp) could suggest that *Ebbrittoniella* has feeding habits different from the ones of the majority of Ceratocanthidae.

KEY TO THE SPECIES OF *EBBRITTONIELLA*

- 1 Labrum distally distinctly truncate, truncature marked dorsally by a slight carina bearing a row of long, fine, erect setae, truncature in frontal view forming a plate irregularly elliptical or semicircular 2
- Labrum without distinct truncature marked dorsally by a carina other Ceratocanthidae
- 2 Anterior angles of pronotum triangular; mesotibiae slender and relatively narrow (W/L ratio \cong 0,2), with inner apical spur of δ δ bent inwards at a right angle; apex of protibiae usually ending with two teeth in the ♀ ♀ (one known exception); apical spur of protibiae strong, apically distinctly bent downwards *Cyphopisthes* Gestro

- Anterior angles of pronotum broadly rounded; mesotibiae short and wide (W/L ratio \cong 0,3), with the inner apical spur of ♂♂ straight and extremely short; apex of protibiae ending with a single tooth in both sexes; apical spur of protibiae fine, very gently and regularly bent downwards.
..... *Ebbrittoniella* Martínez
- 3 Surface of pronotum strongly punctured, punctures very dense, giving a granulose appearance, pronotal pubescence long, yellowish, recumbent, elytra with the same microsculpture and pubescence as pronotum, but with some smooth longitudinal areas, humeral callus very pronounced
..... *E. gestroi* (Paulian)
- Surface of pronotum smooth, with sparse simple or horseshoe shaped punctures, glabrous or at most with very fine and short erect hyaline pubescence, elytra like pronotum, humeral callus weakly pronounced
..... *E. ignita* (Westwood)

DISCUSSION

Some interesting new discoveries about the genitalia of the Ceratocanthidae were made during this revision. First of all it was found that the bursa copulatrix, which contains the spermatophore, bears a small subcircular sclerite on its inner wall, which probably has the function of breaking the spermatophore; similar sclerites have been observed in other genera of Ceratocanthidae, namely *Pterorthochaetes* Gestro, 1899 (Ballerio, 1999), *Philharmostes* Kolbe, 1895 and its allies (Ballerio, 2000) and *Eusphaeropeltis* Gestro, 1899 (author's unpublished data). Secondly a mobile accessory sclerite was detected, lying between the ventral basal extremities of parameres and associated with the median lobe; normally it lies parallel to the anchoring point of parameres with basal piece, but, when the internal sac is everted, the sclerite is raised at right angle, perpendicular to the anchoring point of parameres; it is possibly an intermediate form between an anchoring and a supporting sclerite (see D'Hotman & Scholtz, 1990).

In order to find the closest relationships of the genus *Ebbrittoniella* an analysis was conducted on all the genera of typical Ceratocanthidae, on the basis of all available morphological characters of adults, using the sister group of Ceratocanthidae, i.e. the Hybosoridae (Browne & Scholtz, 1996) and in particular the genera *Phaechrous* Castelnau, 1840 and *Liparochnus* Erichson, 1848 (Howden & Gill, 1995), as an out group for character polarization. The analysis suggests that *Cyphopisthes* Gestro, 1899 could be the genus closest to *Ebbrittoniella*. The following synapomorphies are shared by the two genera: a) outer edge of protibiae smooth (low magnification), b) sexual dimorphism involving the apical teeth of protibiae, c) labrum distally truncate, truncature marked dorsally by a slight carina bearing a row of erect fine setae, d) spermatheca strongly sclerotized and e) metathoracic wings: apical field with a vertical secondary sclerification near the radial cell. The genus *Cyphopisthes* can be divided into two groups, whose definition and status are being dealt with in a separate paper, *Ebbrittoniella* shares four further synapomorphies with the group formed by *C. acromialis*

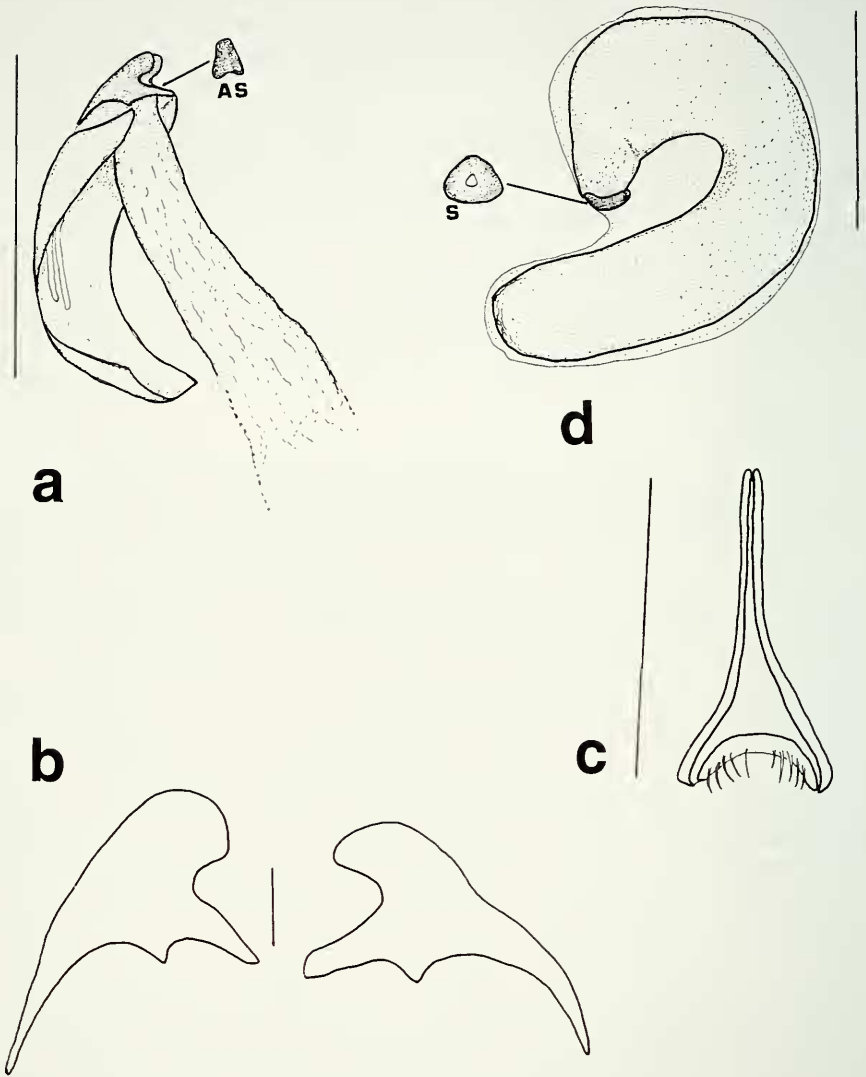


FIG. 5 – a: *E. gestroi* (Cameron Highlands), aedeagus with accessory sclerite (AS) (scale bar: 1 mm); b: *E. gestroi* (Cameron Highlands), parameres (lateral view) (scale bar: 0,1 mm); c: *E. gestroi* (Cameron Highlands) genital segment (scale bar: 1 mm); d: *E. gestroi* (Cameron Highlands), bursa copulatrix with sclerite (S) and spermatophore inside (scale bar: 1 mm).

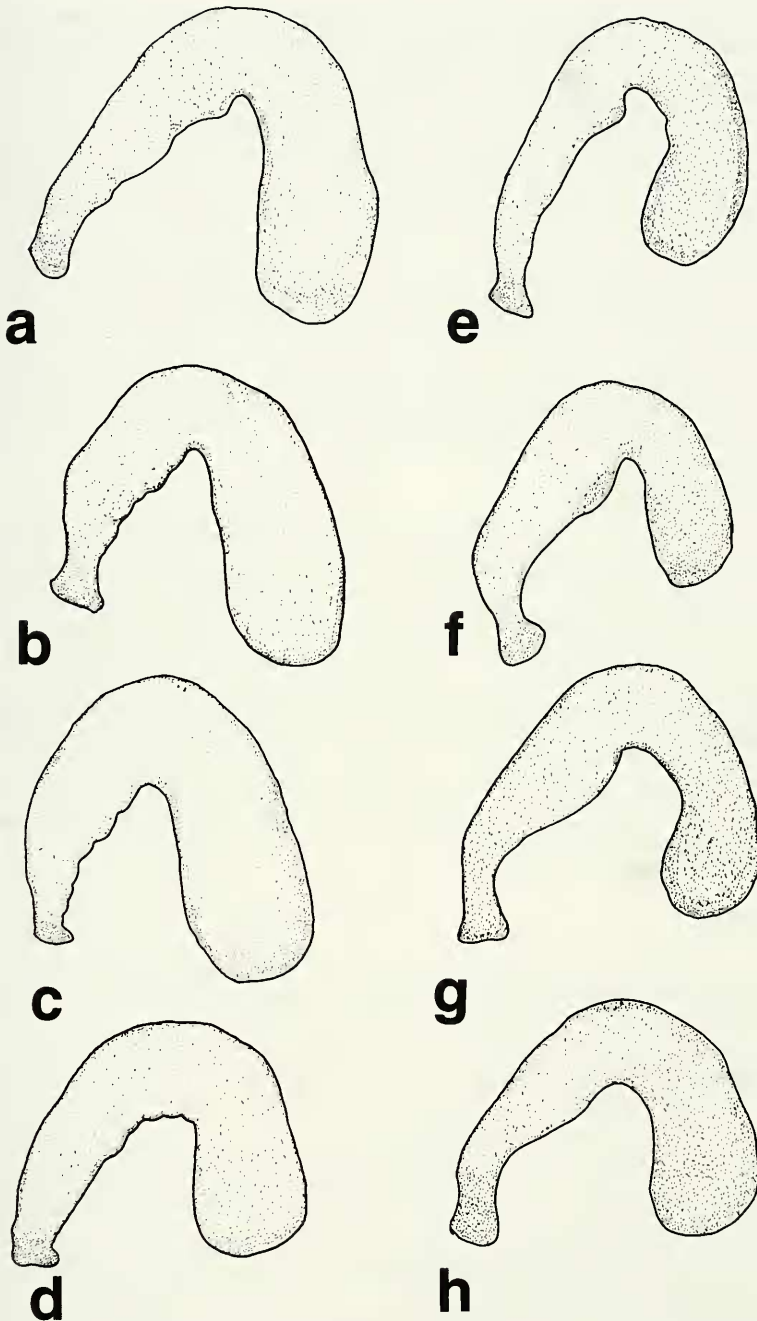


FIG. 6 – a (Lata Jarom), b (Lata Jarom), c (Lata Jarom), d (Sabah: Mendolong): *E. ignita*, spermatheca; e (Borneo: north of Kalabakan), f (Maxwell Hill), g (Cameron Highlands), h (Cameron Highlands): *E. gestroi*, spermatheca (scale bar: 0,1 mm).

(Pascoe, 1860) and few other species, i.e. f) labium with a very deep and wide regular-U-shaped excavation in the middle, g) spermatheca deeply U-shaped, h) bursa copulatrix with a characteristically shaped sclerite, and i) presence of an accessory sclerite among parameres. Characters b), c) and h) are autoapomorphic.

The similarities with *Ceratocanthus* White, 1842 stressed by earlier authors are likely due to convergent evolution and, although at the present stage of knowledge remote relationships cannot be excluded, there are several characters that place *Ebbrittoniella* and *Cyphopisthes* quite far from *Ceratocanthus*. The latter differs at least in the following characters: a) labrum neither abruptly truncate nor divided by any carina, b) elytra without a false epipleuron, c) metathoracic wings: MP_{1+2} - RP loop absent, d) metathoracic wings: apical field without vertical secondary sclerification, e) meso- and meta- tarsi capable of being folded along the longitudinal axis of the inner face of the tibia, f) sexual dimorphism not involving the shape of apical teeth of protibiae and g) spermatheca weakly sclerotized.

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REFERENCES

- ARROW, G. J. 1912. Coleopterorum Catalogus pars 43 - Scarabaeidae: Pachypodinae, Pleocominae, Aclopiniae, Glaphyrinae, Ochodaeninae, Orphninae, Idiostominae, Hybosorinae, Dynamopinae, Acanthocerinae, Troginae. *W. Junk, Berlin*, 66 pp.
- BALLERIO, A. 1999. Revision of the genus *Pterorthochaetes*, first contribution (Coleoptera: Scarabaeoidea: Ceratocanthidae). *Folia Heyrovskyana* 7(5): 221-228.
- BALLERIO, A. 2000. A new genus and species of Ceratocanthidae from Tanzania (Coleoptera: Scarabaeoidea). *African Zoology* 35(1): 131-137.
- BROWNE, D. J. & SCHOLTZ, C. H. 1995. Phylogeny of the families of Scarabaeoidea (Coleoptera) based on characters of the hindwing articulation, hindwing base and wing venation. *Systematic Entomology* 20: 145-173.
- BROWNE, D. J. & SCHOLTZ, C. H. 1996. The morphology of the hind wing articulation and wing base of the Scarabaeoidea (Coleoptera) with some phylogenetic implications. *Bonner zoologische Monographien* 40: 1-200.
- BROWNE, J. & SCHOLTZ, C. H. 1998. Evolution of the scarab hindwing articulation and wing base: a contribution toward the phylogeny of the Scarabaeidae (Scarabaeoidea: Coleoptera). *Systematic Entomology* 23: 307-326.

- D'HOTMAN, D. & SCHOLTZ, C. H. 1990. Phylogenetic significance of the structure of the external male genitalia in the Scarabaeoidea (Coleoptera). *Entomology Memoir Department of Agricultural Development Republic of South Africa* 77, 51 pp.
- GESTRO, R. 1899. Sopra alcune forme di Acanthocerini. *Annali del Museo civico di Storia naturale di Genova* XXXIX: 450-498.
- HOWDEN, H. F. & GILL, B. D. 1995. *Trachycrusus*, a new genus of Ceratocanthinae (Coleoptera Scarabaeidae) with two new species from Peru. *The Canadian Entomologist* 127: 587-593.
- KUKALOVA-PECK, J. & LAWRENCE, J. F. 1993. Evolution of the hind wing in Coleoptera. *The Canadian Entomologist* 125: 181-258.
- LANSBERGE, J. W. VAN 1887. Trogides nouveaux. *Notes from the Leyden Museum* IX:199-211.
- MARTINEZ, A. 1962. Un nuevo género de Acanthocerinae (Col. Scarabaeidae). *Physis* 23 n. 64: 61-64.
- NEL, A. & DE VILLIERS, W. M. 1988. Mouthpart structure in Adult Scarab Beetles (Coleoptera Scarabaeoidea). *Entomologia Generalis* 13 (1/2):95-144.
- NEL, A. & SCHOLTZ, C. H. 1990. Comparative morphology of the mouthparts of adult Scarabaeoidea (Coleoptera). *Entomology Memoir Department of Agricultural Development Republic of South Africa* 80, 84 pp.
- PAULIAN, R. 1942. Coléoptères Acanthocérideres nouveaux ou peu connus. *Revue française d'Entomologie* IX: 70-75.
- PAULIAN, R. 1978. Révision des Ceratocanthidae [Col. Scarabaeoidea] II - Les espèces orientales et australiennes. *Annales de la Société entomologique de France* (N.S.) 14 (3): 479-514.
- PREUDHOMME DE BORRE, A. 1886. Catalogue des Trogides décrits jusqu'à ce jour, précédé d'un synopsis de leur genres et d'une esquisse de leur distribution géographique. *Annales de la Société entomologique de Belgique* 30: 54-82.
- WESTWOOD, J. O. 1883. Two new species of the coleopterous genus *Acanthocerus*. *Notes from the Leyden Museum* 5: 1-2.